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ABSTRACT

The instructional effectiveness of integrating abstract and realistic visualization was studied using five types of visualization, three levels of general ability and two modes of instruction. The dependent variable was performance on a four-part criterion test representing five different types of instructional objectives, which was administered as both an immediate and a delayed posttest. Subjects were 490 10th grade public school students enrolled in coeducational health classes. Half of the subjects received self-paced written instruction and half received externally paced instruction by an audiotape recording with visuals in booklet form. Instruction included either simple line drawings, realistic color photographs, both line drawings and color photographs, hybrid illustrations of realistic photographs and line drawing segments, or no visuals. Results indicate that the integration of abstract and realistic visualization does not appear to improve effectiveness generally. However, it may enhance externally paced instruction and may reduce achievement differences between students of varied ability, particularly when both types of visualization are presented together. Inclusion of realistic visualization can enhance instruction, while inclusion of abstract visualization should be based on consideration of pacing, general ability, and type of instructional objectives. (LMM)

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THE INSTRUCTIONAL EFFECTIVENESS OF INTEGRATING ABSTRACT AND REALISTIC VISUALIZATION

by

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The Instructional Effectiveness of Integrating Abstract and Realistic Visualization

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A. Problem

The relative effectiveness of abstract and realistic visualization is debated in the literature and by practitioners. Various theories support both the general preference for realistic visuals and the notion that there is a limit to the useful detail in visuals. Related research suggests the possibility that integration of abstract and realistic visualization might prove effective under more general conditions with respect to the learner, content, and presentation.

The purpose of this study was to assess the instructional effectiveness of integrating abstract and realistic visualization. Independent variables were: 1) five types of visualization, including two methods of integrating abstract and realistic visualization; 2) three levels of general ability; and 3) two modes of instruction. The dependent variable was performance on a four-part criterion test, representing five different types of instructional objectives. The criterion test was administered twice, first as an immediate and again as a delayed posttest.

B. Rationale

The general preference for realism in educational practice is reinforced by several theorists including Dale (1946), Morris (1946) Carpenter (1953). Other research supports the notion that realistic visuals arouse interest, gain and sustain attention, or provide a rewarding condition (French, 1952; Spaulding, 1955; Dember, 1960; Yarbus, 1967; Haber, 1973; Hanes, 1973; Kahneman, 1973).

Other theorists argue that an increase in realism may not lead to increased learning and that irrelevant cues may interfere with communication (Gibson, 1954; Broadbent, 1958, 1965; Hochberg, 1962; Travers, 1964, 1970; Dwyer, 1972). Dwyer found that the type of visual illustration which was most effective for instruction was dependent upon the type of information to be communicated, whether the instruction was self-paced or externally-paced, the grade level, the level of entering behavior, and the level of general ability.

C. Procedure

Subjects were 490 tenth grade public school students enrolled in coeducational health classes. The subjects were stratified into high, medium and low general ability groups on the basis of their scores from the Analysis of Learning Potential test. All subjects received a general physiology pretest prior to instruction. The instructional unit and criterion tests were those developed and used by Dwyer (1972).

The criteria were a drawing test with 18 items and identification, terminology and comprehension tests with 20 items each. Together these four tests constituted a total criterial test.

Half of the subjects received self-paced written instruction and half received externally-paced instruction by an audio tape recording (with visuals in booklet form). Within each of these two modes the students received one of the five treatments: instruction with simple line drawings, instruction with realistic color photographs (3X5 inches), instruction with both line drawings and color photographs, instruction with hybrid illustrations of realistic photograph and line drawing segments, and a control group with no visuals. Treatments were randomly assigned to subjects. All students received the four-part criterion test on the day immediately following the instruction and again after two weeks.

D. Analysis

The two methods of integrating abstract and realistic visualization were each separately compared with the control group, the realistic visualization treatment group and the abstract visualization treatment group. These separate comparisons constituted a set of contrasts in a two-by-two matrix formed by the absence or presence of realistic visualization versus the absence or presence of abstract visualizations. This analysis model was chosen in order to facilitate identification of the anticipated additive effect of integration as an interaction of two factors.

The primary analysis involved a five-factor mixed design denoted RS_n in $(A_2 @ B_2 @ C_2 @ D_3) @ J_4$. Random subjects were nested in cells formed by the four factors: the realism variable, the abstraction variable, the presentation mode variable, and the general ability variable. All subjects are crossed with four levels of the dependent criterion variable. A total criterion test score which combined the other four scores were analyzed separately.

Because two methods of integrating realistic and abstract visualization were being contrasted, the entire design was analyzed twice with one oblong formed by the A and B factors being changed.

A separate analysis was used to compare the two methods of integrating abstract and realistic visualization across the pacing and general ability factors. This secondary design was denoted $RS_n (A_2' @ B_2' @ C_3') @ J_4'$.

The library program ANOVR was used for the principal analysis of variance computations. The library program FOLUP was used for the follow-up comparisons of means after significant F tests. The Tukey Wholly Significant Difference test was specified.

E. Results

In the analysis of variance procedures for both the immediate and delayed posttests, the two-way interaction effects which compared the four types of visualization were non-significant. In the analyses comparing the two methods of integrating abstract and realistic visualization the main effects of interests were similarly non-significant. Accordingly, the analyses of both the immediate and delayed posttest scores failed to reject the null hypotheses. Follow-up tests were conducted in a post-hoc investigation of other significant effects.

The specific findings of the various analyses are too numerous for inclusion here; however, several results of interest are:

1. Abstract visualization tended to enhance externally-paced instruction more than self-paced instruction.

2. Students who received instruction accompanied by realistic visualization achieved significantly higher scores than students who received instruction which was not accompanied by realistic visualization.

3. Simultaneous use of both real and abstract visualization appears to be more effective than integration through use of the hybrid visual.

4. Use of both real and abstract visuals tended to reduce the difference in performance of different ability groups on certain tests.

G. Discussion

The results of both posttests suggest that designers of visualized instruction may expect to enhance its effectiveness under general conditions by inclusion of realistic visualization. Inclusion of abstract visualization cannot be expected to improve effectiveness under general conditions and should be based on consideration of pacing, general ability and type of instructional objective.

Although the integration of abstract and realistic visualization does not appear to improve effectiveness generally, it may serve to enhance externally paced instruction and may reduce the difference in achievement between students of different general ability, particularly when both types of visualization are presented together.